—relics of the earlier Buddhist era and of the Chinese dominion. Such treasures are probably also to be found in Japan and Corea. It is known that there are Japanese versions of Hiuan Thsang's journey; and Prof. Vasilieff has been informed that manuscripts written on palm-leaves, and brought from India, have been seen in Corea. Many Coreans formerly visited India as Buddhist pilgrims.

A LIST of publications issued by the authority of the Department of Science and Art has just been published. It includes publications specially relating to instruction in science and art, publications relating to the South Kensington Museum, catalogues of reproductions and of loan collections, miscellaneous publications, hand-books, books of photographs, and diagrams.

MESSRS. GIARD AND BONNIER have just published a valuable memoir on the anatomy of the Bopyridæ, with good illustrations.

WHALES—the so-called "herring" whales, which follow the shoals of that fish—are very numerous off the west coast of Norway this winter, and large catches have been made.

IN the Report of a Committee appointed by the British Association "for the purpose of investigating . . . the quantity and character of the water supplied to various towns and districts" from the permeable formations of England, a very misleading statement as to the character of the water-supply of Cheltenham was made. In a later Report of the same Committee, just issued, the error is frankly admitted. "In the Eleventh Report of your Committee," we read, "by a most unfortunate misprint, the reservoirs are described as 'dry' during the drought of 1884, instead of 'short,' as reported by a correspondent, in which statement he was obviously incorrect. Your Committee much regret that the condition of the Cheltenham Waterworks should have been misrepresented by them, as they were fully aware of the ample supply and pure quality given to the town by the Corporation, the purity of which has been testified to by Drs. Allen Miller, Frankland, Way, and Tidy, and Prof. Voelcker."

THE *Brighton Herald* says it is expected that the medallion portrait of the late Dr. Thomas Davidson, F.R.S., Gold Medallist of the Royal Society, Wollaston Medallist of the Geological Society, and first Chairman of the Brighton Museum Committee, executed in marble for the Committee of the Davidson Memorial by Mr. Thomas Brock, A.R.A., will be unveiled early in the new year. The work is said to be an excellent likeness.

A SHOCK of earthquake was reported from Oberhausen on December 9. The direction was from west to east.

LAST week Sir John Lubbock delivered an interesting address in Queen Street Hall, Edinburgh, to the members of the Edinburgh Philosophical Institution on "The Sense and Senses of Animals." He said one would gratefully admit that the dog was a loyal and true and affectionate friend, but when we came to consider the nature of the animal our knowledge was very limited. That arose a good deal from the fact that people had tried rather to teach animals than to learn from them. It had occurred to him that some such method as that which was followed in the case of deaf-mutes might prove instructive if adapted to the case of dogs. He had tried with a black poodle belonging to himself. He then went on to relate several experiments he had made with pieces of cardboard with different words marked upon them. He had taken two pieces of card, one blank and the other with the word "food" upon it. He had put the latter on a saucer containing some bread and milk, and the blank card he put on an empty saucer. The dog was not allowed to eat until it brought the proper card to him. This experiment was repeated over and over again, and in about ten days the dog began to distinguish the card with the letters on it from the plain card. It took a longer time to make the dog realize the difference between different words. In order to try and discover whether the dog could distinguish colours, he prepared six cards, marking two of them blue, two yellow, and two orange. He put one of each on the floor, and tried to get the dog to bring to him a card with the same colour as one which he showed the dog in his hand. After trying this for three months, he found that his experiment in this direction was a failure. He had always felt a great longing to know how the world appeared to the lower animals. It was still a doubtful point whether ants were able to hear. From experiments which he had made, he had come to the conclusion they had not the power of addressing each other. His impression on the whole was that bees and ants were not deaf, but that they heard sounds so shrill as to be beyond our hearing. There was no doubt about insects seeing. He related several experiments he had made with the view of discovering whether different insects could distinguish different colours and had any preference for particular colours. The colours of objects produce upon insects an impression very different from that produced on human beings. The world to them might be full of music which we could not hear, colours which we could not see, and sensations which we could not feel.

THE additions to the Zoological Society's Gardens during the past week include a White-crested Guan (*Pipile jacutinga*) from Guiana, presented by Captain J. Smith, s.s. *Godiva*; two Silky Bower Birds (*Ptilonorhynchus violaceus*) from New South Wales, deposited; two Viscachas (*Lagostomus trichodactylus*) born in the Gardens.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 JANUARY 1-7.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on January 1

Sun rises, 8h. 8m.; souths, 12h. 3m. 39·5s.; sets, 15h. 59m.: right asc. on meridian, 18h. 46·0m.; decl. 23° 2′ S. Sidereal Time at Sunset, 22h. 42m.

Moon (at Last Quarter on January 6, 12h.) rises, 17h. 29m.*; souths, 1h. 31m.; sets, 9h. 25m.: right asc. on meridian, 8h. 12·0m.; decl. 19° 10′ N.

Planet.	Rises.	Souths.	Sets.	Right asc. and declination on meridian.	
	h. m.	h. m.	h. m.	h. m.	°
Mercury..	7 33	11 19	15 5	18 1·7	24 19 S.
Venus ...	4 19	8 55	13 31	15 37·1	16 38 S.
Mars ...	0 21	6 9	11 57	12 50·3	3 6 S.
Jupiter ...	4 37	9 0	13 23	15 42·1	18 47 S.
Saturn ...	17 59*	1 49	9 39	8 29·2	19 31 N.
Uranus ...	0 50	6 23	11 56	13 3·9	6 5 S.
Neptune.	13 19	20 59	4 39*	3 43·0	17 57 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Occultations of Stars by the Moon (visible at Greenwich).

Jan.	Star.	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image.	
			h. m.	h. m.	°	°
1	*d*′ Cancri	6	4 13	near approach	200	—
5	*b* Virginis	6	2 16	3 24	53	209

Jan.	h.	
1	9	Saturn in conjunction with and 0° 55′ north of the Moon.
2	16	Venus in conjunction with and 1° 51′ north of Jupiter.
4	1	Mercury at greatest distance from the Sun.
6	9	Mars in conjunction with and 2° 46′ south of the Moon.

Saturn, January 1.—Outer major axis of outer ring = 45″·8; outer minor axis of outer ring = 15″·1; southern surface visible.

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Variable Stars.

Star	R.A. (1888·0) h. m.	Decl. (1888·0) ° ′			h. m.	
U Cephei	0 52·4	81 16 N.	Jan.	5,	22 42	*m*
Algol	3 0·9	40 31 N.	,,	3,	18 55	*m*
λ Tauri	3 54·5	12 10 N.	,,	3,	18 23	*m*
ζ Geminorum	6 57·5	20 44 N.	,,	3,	23 0	*M*
R Canis Majoris	7 14·5	16 12 S.	,,	2,	20 46	*m*
			,,	4,	0 2	*m*
U Virginis	12 45·4	6 10 N.	,,	7,		*M*
δ Libræ	14 55·0	8 4 S.	,,	1,	21 9	*m*
R Libræ	15 47·3	15 54 S.	,,	5,		*M*
U Ophiuchi	17 10·9	1 20 N.	,,	3,	3 52	*m*
		and at intervals of			20 8	
R Lyræ	18 51·9	43 48 N.	Jan.	1,		*m*
R Sagittarii	19 10·1	19 3 S.	,,	3,		*M*
R Sagittæ	20 9·0	16 23 N.	,,	3,		*m*
T Vulpeculæ	20 46·7	27 50 N.	,,	3,	4 0	*m*
Y Cygni	20 47·6	34 14 N.	,,	1,	21 26	*m*
			,,	4,	21 19	*m*
δ Cephei	22 25·0	57 51 N.	,,	2,	19 0	*M*

M signifies maximum; *m* minimum.

Meteor-Showers.

	R.A.	Decl.	
Near ζ Cancri	119°	16° N.	Bright and swift.
,, θ Ursæ Majoris	140	57 N.	Very swift and short.
The *Quadrantids*	228	53 N.	January 1, 2, and 3.

GEOGRAPHICAL NOTES.

THE two great medals of the Paris Geographical Society have been awarded to General Alexis de Tillo for his great topographical work on Europe and Asia, and to M. Alphaud, Inspector General of the Ponts et Chausées, who, "by inspiring a feeling for the beautiful and of the necessities of hygiene, has done so much to improve the topography of the capital." Medals of the first class were awarded to M. Enguehard, geographical draughtsman; Prof. Francois Bazin; Prof. Maxime Mabire; Prof. Paul Gaffarel, for a work on the soil of France; M. Fauve, for his fine topographical works; M. Ch. Lasalle, for a work on the defences of France; M. Pierre Collet, for his relief plans; Lieut. Somprou; M. Poinet; and M. Verragen.

LIEUT. VON FRANCOIS and Dr. Wolf will start shortly on a scientific mission to Togoland, one of the German possessions on the West Coast of Africa.

IN the new part of the Journal of the Manchester Geographical Society there is an instructive paper by the Rev. R. P. Ashe on Uganda, and the manners and customs of its people.

NEWS from Africa states that the well-known African traveller, Herr Gottlob Adolf Krause, has returned to Accra on the Gold Coast. In May 1886 he commenced his exploring expedition. Starting from Accra and crossing the River Acropang-Volta at Kpang, he proceeded in an easterly direction, passing through Kpando, Krahje, Salaga, Dagomba, Walawala, East Gurunsi, and Busanga to Wagaduga and Ban Djagara, penetrating to within a few miles of Timbuctoo. On his return he journeyed through West Gurunsi, the Ashantee District, Kintimso, Salaga, Sogede, Baleta, Gheshi, Atakpama, and Pla. Lieut. Kund on his journey to Cameroon met Herr Krause at Accra, and sends this report. Herr Krause states that to the north of Salaga the influence of the Sahara is most prominent, and the country is more desolate the further north one goes. Rice and tobacco are universally cultivated. The principal articles of commerce are kola-nuts and salt, the district being chiefly inhabited by the Fula tribe. Nearer to the coast there are several other tribes and dialects, but the Haussa language is most generally spoken. Most of the population is still heathen, but some of the merchants and better educated families are Mohammedans. Herr Krause was not enabled to proceed as far as Timbuctoo, owing to the unfriendliness of the Sheikh Tidchani.

THE *Bollettino* of the Italian Geographical Society for October and November publishes a valuable paper by Sig. A. Borda on the geography, history, and present social conditions of the Republic of Columbia (New Grenada), which promises to enter on an era of peace and prosperity under its enlightened and popular President Nunez, who was elected last June for a term of six years. The present population is calculated on official returns at about four millions, including 200,000 still living in the tribal state in the more inaccessible forest regions. These forests are described as abounding in a great variety of valuable trees yielding the finest cabinet woods, balsams, gums, dyewoods, alimentary and medicinal products. The flora and fauna are scarcely exceeded by those of any other land in diversity of types, while the country contains vast supplies of minerals, such as gold, silver, platina, rubies, emeralds, crystals, porphyry, salt, and sulphur. Since the conquest till the present time the yield of the precious metals is estimated at £130,000,000, mined chiefly in the departments of Canea and Antioquia. Mining operations, which had suffered much from the unsettled state of the country, have recently received a fresh stimulus by the introduction of foreign capital and improved engineering appliances. The metalliferous districts, which occur at various elevations, and especially along the river valleys, are stated to be generally salubrious, and foreigners are now enabled to purchase mines on the same terms as the natives. But the great natural resources of Columbia still lie almost untouched, chiefly through the lack of good and regular communications, the roads being generally impracticable for wheeled traffic, while the railway system is little developed. Besides the Panama, Bolivar, and Cucuta lines already open, others are in course of construction in the departments of Canea, Antioquia, Cundinamasca, Tolima, and Santander. The great water highway of the Maddalena has a fleet of twenty-five steamers, and is connected with the seaport of Cartagena by the Digue, a navigable canal branching off at Calamar. The yearly imports from Europe and the United States average £3,000,000, and the exports £1,600,000. The revenue for 1887-88 is estimated at £4,000,000, the expenditure £4,600,000, and the public debt £4,500,000, half internal and half foreign. The Government has still at its disposal extensive domains, which are granted on favourable terms to immigrants as well as to native and foreign speculators. At present the country is in the enjoyment of profound peace, with improved external and internal relations, and a general desire to close once for all the era of aimless political revolutions.

JOURNAL OF THE ROYAL AGRICULTURAL SOCIETY.[1]

THE most recent number of this Journal well keeps up the credit of its predecessors in spite of the grievous loss the Society sustained a year ago in the death of its talented editor, Mr. H. M. Jenkins. The contributors include the Earl of Coventry, Sir F. Bramwell, F.R.S., Drs. J. Voelcker and P. Vieth, Major Craigie, Principal W. Robertson of the Royal Veterinary College, Mr. James Macdonald, of Edinburgh, Messrs. Bernard Dyer, Albert Pell, Charles Whitehead, William C. Little, Charles Clay, Herbert J. Little, and others. Since these remarks were penned, we regret to hear of the sudden death of Principal Robertson, of the Royal Veterinary College.

The contents may be classified as—strictly agricultural, comprising articles on ensilage, sheep-feeding experiments, and reports on the prize-farm competitions in Northumberland; statistical, as presented in papers upon twenty years' changes in our foreign meat supply; engineering, as represented in trials of portable engines, and report of the consulting engineers at Newcastle; and purely scientific, as in papers on micro-organisms and their action on milk and milk products, on protective inoculation for anthrax and quarter ill, and on the progress of the Hessian fly.

Few of the papers possess such a wide general interest, both scientific and sanitary, as that of Dr. P. Vieth, on the action of micro-organisms on milk. Milk is subject to *lactic* fermentation, caused by the presence of a bacillus, consisting of short motionless rods propagating by segmentation. The effect of these bacilli is to cause the milk to sour and lose its liquid character, and assume the appearance of a gelatinous mass. The milk, in fact, "turns," and a separation of the curd from the whey follows, as though rennet had been added, but from a different cause. It is also now shown that lactic fermentation requires to be induced by the introduction of bacilli from without, after the milk is drawn from the cow, and that it is not inherent

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[1] "Journal of the Royal Agricultural Society," Series II. vol. xxiii. Part II., 1887. (John Murray, Albemarle Street.)

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